Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

JUL 14 1995

95-PCA-394

Mr. David L. Lundstrom
Section Manager
200 Areas
Nuclear Waste Program
State of Washington
Department of Ecology
1315 West Fourth Avenue
Kennewick, Washington 99336

Dear Mr. Lundstrom:

TRANSMITTAL OF THE HANFORD FACILITY 222-S LABORATORY COMPLEX AGREEMENT OF LEAK DETECTION REQUIREMENTS FOR PROJECT W-087, RADIOACTIVE LIQUID WASTE LINE REPLACEMENT (TS-2-1)

This letter requests written concurrence with an agreement reached between the U.S. Department of Energy, Richland Operations Office (RL); Westinghouse Hanford Company (WHC); and the State of Washington Department of Ecology (Ecology) on leak detection requirements for Project W-087, "Radioactive Liquid Waste Line Replacement (Project W-087)." Project W-087 will upgrade the drain system and install leak detectors in the 222-S Laboratory Complex (222-S), Analytical Laboratory (222-SAL), and the 219-S Waste Handling Facility (219-S).

On March 22, 1995, a meeting was held among Ecology, RL, WHC, and ICF Kaiser Hanford (ICF KH) regarding leak detection/removal requirements as stated in Washington Administrative Code (WAC) 173-303-640(4)(c)(iii) and (iv) "Tank Systems." The WAC 173-303-640(4)(c)(iii) requires a leak detection system to detect a failure of either the primary or secondary containment structures within 24 hours and (iv) requires removal of spilled or leaked waste and accumulated precipitation within 24 hours.

Mr. Russell Warren of RL, Mr. John Beyer of WHC, and Mr. Chuck Zook of ICF KH explained that the drain system provides a path for liquid waste to be transferred to the 219-S storage tanks by gravity flow. Liquid from a leak would take longer than 24 hours to reach a leak detector because of the sporadic flow rate (approximately 24 gallons per day) and the force necessary to overcome the surface tension of 350 feet of piping. Mr. Zook presented Ecology with a discussion paper describing the sporadic flow rate, length of piping, construction materials, and description of where the leak detectors will be installed. It was concluded that the leak detectors planned for installation in the 222-SAL, and 219-S are in compliance with the requirements of WAC 173-303-640.

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Mr. Moses Jaraysi of Ecology agreed that the planned installation and arrangement of the leak detectors within the 222-SAL and 219-S meets the intent of and therefore is in compliance with WAC 173-303-640(4)(c). Please provide written concurrence documenting this agreement.

Please contact Mr. C. E. Clark, RL, on (509) 376-9333, Mr. R. N. Warren, RL, on (509) 376-7330, or Mr. R. C. Bowman, WHC, on (509) 376-4876 should you have any questions regarding this letter.

Sincerely,

James E. Rasmussen, Director
Environmental Assurance, Permits,
and Policy Division
DOE Richland Operations Office

EAP:CEC

William T. Dixon, Director
Environmental Services
Westinghouse Hanford Company

Enclosure:
Discussion Paper on Project W-087,
Leak Detection Requirements

cc w/encl:
EDMC, H6-08
D. Duncan, EPA
M. Jaraysi, Ecology
C. Zook, ICF KH

cc w/o encl:
R. Bowman, WHC
W. Dixon, WHC
R. Jim, YIN
D. Powaukee, NPT
S. Price, WHC
J. Wilkinson, CTUIR

222-S LABORATORY RADIOACTIVE LIQUID WASTE DRAIN LINE AND LEAK DETECTION ENVIRONMENTAL COMPLIANCE UPGRADE

PROJECT W-087

SUBJECT: W-087, DISCUSSION OF PIPING LEAK DETECTION WAC REQUIREMENTS

PREPARED BY: C. R. ZOOK DATE: MARCH 17, 1995

The 222-S Laboratory Complex (222-S) radioactive liquid waste drain system is being replaced with double walled piping and leak detection as required by Washington Administrative Code (WAC) 173-303-640 (final status).

> "(4)(c)(iii) Provided with a leak-detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of dangerous waste or accumulated liquid in the secondary system within twenty-four hours, or at the earliest practicable time if the owner or operator can demonstrate to the department that existing detection technologies or site conditions will not allow detection of a release within twenty-four hours; and
>
> (iv) Sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spills, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within twenty-four hours, or in a timely a manner as is possible to prevent harm to human health and the environment, if the owner or operator can demonstrate to the department that removal of the released waste or accumulated precipitation cannot be accomplished within twenty-four hours."

The piping will have a minimum slope of 1/8 inch per foot and will have leak detection to detect any leaks from the primary piping into the secondary pipe (encasement). The design has two detectors on each drain collection header. One will be installed inside 222-S Analytical Laboratory (222-SAL) where the pipe exits the building. The other detector will be located at the 219-S Waste Handling Facility (219-S). Any leak can be identified as either being in 222-SAL or in the buried pipe going to 219-S.

Both the 2 inch inner and 4 inch outer pipe are designed for 30 year life. The pipes are to be fabricated using Schedule 40S, ASTM A 312, Grade TP 304L stainless steel. The estimated corrosion rate obtained from NACE standard tables will be approximately 0.001 inch per year. This is based on

the pipe. The 2 inch primary pipe has a 0.154 inch thick wall and the 4 inch secondary has a 0.237 inch thick wall. Based on corrosion alone the primary pipe should last 0.154/0.001 = 154 years without a leak and the secondary pipe will have a life of 0.237/0.001 = 237 years without a leak.

Engineers at 222-S indicate that over the previous 40 years leaks have occurred using the same pipe materials. However, the leaks have occurred mostly at elbows and weld joints. Weld failure probably occurred due to less stringent quality assurance standards than those acceptable today. Also during the period REDOX was operating, a lot of debris was washed down the drains. This caused puddling to occur as the debris settled out of the slow moving fluid. Today, 222-S laboratory procedures restrict the practice of washing solids into the drains. Waste reduction programs, on the other hand, encourage using as little flush water as practicable which compounds the settling problem. The ideal system would be a continuously flowing collection system which would continuously wash the pipe of any solids and concentrations of chemicals which cause corrosion.

There has been much discussion about why there is so much conservatism built into the system. The waste generated and dumped into the drain will be a nonhomogeneous assortment of chemicals used by chemists performing tests on various radioactive waste forms. However, this waste will be only beaker or test tube quantities. These small volumes will then be flushed down the drain by washing the drain using water from a small low pressure tube (most are 1/4 inch). The drain lines from the various glove boxes and hot cells are 1 inch to 2 inch diameter and feed into the main 2 inch header that is sloped a minimum of 1/8 inch per foot inside 222-SAL and 1/4 inch per foot outside 222-SAL toward 219-S. Any liquid will drain by gravity to 219-S. The waste plus flush water is estimated to not exceed 50,000 gallons per year. If the 222-S only worked 5 days per week for 8 hour per day the flow rate would be 24 gallons per hour or 0.4 gallons per minute. The 222-S actually works 24 hours per day so the average flow rate is 0.133 gallons per minute. The flow actually is sporadic. As different experiments are performed, the flow will come from different sources at different times each day, month, or year. As an example, the 219-S, tank 103, received zero gallons over the weekend but received 5 gallons on Tuesday and 9 gallons on Thursday of the following week. The 219-S, Tank 101, collected 10 gallons Monday, 30 gallons Tuesday, 40 gallons Wednesday, 20 Friday and 60 gallons over last weekend.

The significant part about the sporadic flow rate is that there is never enough pressure or flow to cause a significant leak. Mr. Moses Jaraysi of the State of Washington Department of Ecology agreed that the WAC appears to have been written for pressurized piping systems. This system is strictly gravity drain. Any leak that occurs in this system will be the size of a drip as a pin hole corrosion opening expands large enough to enable the liquid to overcome surface tension and wet the outside of the primary pipe or form a droplet of fluid. This would then drop to the secondary containment where it would have to wet this pipe and overcome surface tension as it travels to the leak detector. The leak detector is a continuity probe inserted vertically into a short horizontal section of 2 inch Schedule 40 pipe connected to the bottom of the 4 inch Schedule 40 encasement by a drop leg. A normally closed valve forces leakage to accumulate below the detector. A minimum of

0.02 gallons, about 1/4 inch, of liquid is required at the leak detector to activate the detector. Should the detector activate it will energize a specific leak detector annunciator in 219-S which in turn will activate a general leak detector annunciator in 222-SAL control room. The operator in 222-SAL control room will see the general alarm. Operations will then identify which specific leak detector had been activated at the 219-S. Leakage collected in the encasement can be disposed of in two ways. The detectors located in 222-SAL are at the low point in the 222-S drain piping. There is a 2 inch pipe adjacent to each detector which can be used to facilitate draining the leakage into a drum or carboy. The drum will then be transported to the Double-Shell Tank System for disposal. At 219-S the same detector/valve arrangement is coupled directly to the same tank as the primary drain line. To summarize, the form of leak discussed above could not be detected within the 24 hour regulatory time limit. However, this leak would be determined long before it corrodes through the secondary pipe. Any sizable leak will be detected within minutes and action will be initiated to correct the problem. In both cases there will be no threat of contamination leaking to the environment.

Consideration has been given to installing continuous leak detection cable along the bottom of the containment pipe. This is impractical in light of the postulated type of leak and the design life of the pipe. Continuous leak detection systems also are susceptible to maintenance problems and are a source of many erroneous signals.

To summarize, corrosion rates of pipe material, addition of secondary containment, administrative controls and laboratory procedures, cathodic protection, an asphalt covering which will prevent moisture from reaching the buried pipe (hence reducing the risk of external corrosion to the secondary containment), prohibit the need for continuous leak detection any more sophisticated than that proposed by the project.